Digital Mathematical Libraries:
Search

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Background

- Applications – cosmology, industrial optimization, …
- Software – computer alg, compilers, simulation, math handwriting, algorithm differentiation
- Theory – symbolic-numeric, sympolic exponents, …

- Maple, Axiom, Aldor, MathML, InkML

For what can we search?

The obvious…

- **Definitions, Theorems**
  - Within a work, within a corpus of literature

- **Conjectures, Examples, Counter-Examples**

For what can we search?

By meaning, rather than notation….

- Finding Airy functions when looking for Bessel.

By notation, rather than meaning….

- *J* Angular momentum? Bessel function? Prog language?

Sometimes want one, sometimes the other.

For what can we search?

Common expressions

- Often see same expression over and over again in particular sub-areas.

Common expressions, modulo a theory

- E.g. subject to associativity, commutitivity, identities
- Subject to antiunification, e.g. sqrt(A^2 + B^2)

For what can we search?

While working on a proof or calculation...

- What can I do *now*?
  - *Applicable* identities, theorems, constructions, ...

- Where might this *go*?

For what can we search?

While computing….

- Help using commands in Maple, Mathematica, etc.

- Finding what command to use in Maple, Mathematica, etc.

For what can we search?

While computing….

- Help using commands in Maple, Mathematica, etc.

- Finding what command to use in Maple, Mathematica, etc.

- Finding related identities, theorems, papers while working in a CA system.

For what can we search?

When approaching a new problem or area…

- What are the main results in this area?

- What is the necessary background to understand this paper/theorem?

- How does this relate to *what I already know?*

For what can we search?

When thinking about a new problem or area…

- What are the rivers of references and composed constructions running through a library?

- Who knew what when?

- Who else is working on this now?

- What are the parts that need results?